Convergence and Divergence in Government Bond Markets: Implications for Monetary Policy

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I.   Introduction

I am very honored to participate in this panel. I want to focus on recent developments in government bond yields from a cross-country perspective and their implications for ECB monetary policy. Most of the time bond markets are a central bank's friend (some would even say a central bank's accomplice), because they play a crucial role in transmitting the policy stance to the economy. They often anticipate the central bank's reaction to news and thereby function as automatic stabilizers. They also provide market discipline, e.g., when signaling the appearance of credit risk. But there are times in which bond markets seem to live their own life and are subject to shocks that are less useful from a domestic stabilization perspective. These shocks may come from abroad in a globally integrated bond market; they may be driven by fads and fears like occasionally happens in other financial markets; or they may be the result of a breakdown in arbitrage, which is typical in a financial crisis.

It is against this background, "Government bond markets: friend or foe?" that I want to talk about cross-country bond yield convergence and divergence with two contrasting stories. One is about high

and increasing cross-country correlations; the other is about a dramatic breakdown of comovement.

The first story is illustrated in Chart 1. It shows that government bond yields in the advanced economies strongly comove. This has been a feature of the global government bond market since the second half of the 1980s, when the correlation in the longer segment of the yield curve increased very significantly.[1] The timing of this increase in the comovement is of course not a coincidence. It is the start of financial deregulation and globalization in the early 1980s and also the beginning of the Great Moderation with the establishment of price-stability oriented monetary policy frameworks in many countries. Nevertheless, economists have been puzzled about the extent of the comovement. One of the earliest papers to notice this is probably Sutton (2000). He concluded that the correlation was too high to be fully explained by the correlation of the main fundamentals, which according to the expectations hypothesis are the short-term, policy-controlled, interest rates. And therefore he conjectured that part of the correlation must be driven by the international comovement of the term premium. This raises questions for domestic monetary policy, which are of particular relevance in the current context of rising international bond premiums. What determines the international term premium and how does it affect the domestic economic outlook? Can the central bank directly affect this term premium and more generally, what to do, when the term premium moves against where the central bank wants the long-term bond yield to go?

The second story is the opposite, shown in Chart 2. It's the dramatic breakdown of the almost (too) perfect correlation between government bond yields within the euro area since the start of the financial crisis. In this case, this cannot be the result of a breakdown in the correlation of short-term interest rates as all those countries are in a single currency area and therefore face the same policy-controlled rates. Neither can it be the result of a reversal of the liberalization of capital markets as the single market continues to prevail in the European Union. In this case, it is due to the emergence of sovereign credit and liquidity risk premiums. There is a rapidly growing empirical literature that tries to understand the relative role of fiscal
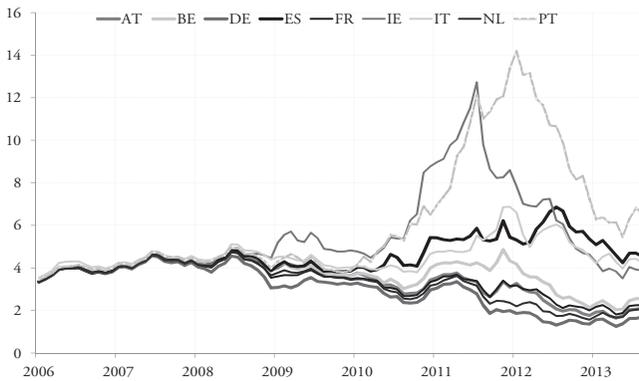
Chart 1
Ten-Year Government Bond Yields in
Advanced Economies
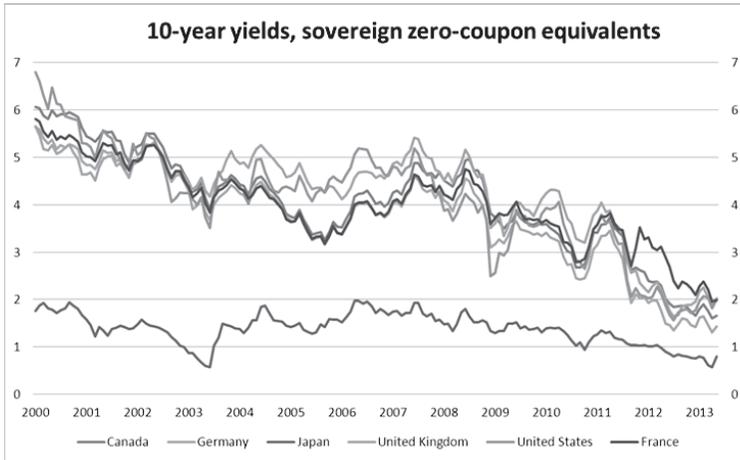
Sources: Bloomberg; latest observation: July 2013.
Note: First principal component explains 88 percent of the variance across countries.

Chart 2
Ten-Year Government Bond Yields in the Euro Area

Source: Thomson Reuters; latest observation: August 2013.

fundamentals and self-fulfilling expectations in driving the rise and fall in sovereign spreads in the euro area.[2] I will not review this literature in detail, but it is fair to say that fiscal and economic fundamentals matter a lot in explaining the cross-section of spreads at any particular time since the start of the financial crisis. It is also clear that one needs important time-variation in the pricing of these sovereign risks to try to get close to capturing the time-variation in spreads; and that the run-up and fall in the price of risk was partly driven by fears of EMU breakup and the associated dynamics of self-fulfilling expectations. This divergence of sovereign yields in the euro area has had profound effects on the functioning of the single currency area. It has been associated with financial fragmentation, very heterogeneous developments in the cost of credit across countries, with important implications for the ECB's monetary policy response, which I briefly want to spell out in the second part of this contribution.

II.   International Comovement of Bond Yields

A simple principal component analysis shows that one global factor explains about 88 percent of the overall variance of the long-term bond yields shown in Chart 1. How can we explain this large comovement?

An obvious explanation is that economic activity and inflation comove across those countries and therefore also the short-term interest rates. Indeed, academic literature has pointed out that there is a world business cycle (e.g., Kose et al. 2003) and that also inflation is driven by global factors (e.g., Ciccarelli and Mojon 2010). Chart 3 confirms that a global factor explains 81 percent of the variation in one-year interest rates, 84 percent of the variation in the annual growth rate of production and about 60 percent of annual CPI inflation rates across the same six advanced economies. But note that none of these comovements is as large as the one for long-term rates, highlighting Sutton's puzzle of excess comovement.

A recent academic literature that jointly estimates sophisticated term structure models for the major advanced economies basically confirms that 1) global factors, typically associated with global inflation and the global business cycle, are important drivers of the term structure; and that 2) in addition to a synchronized monetary policy

Chart 3
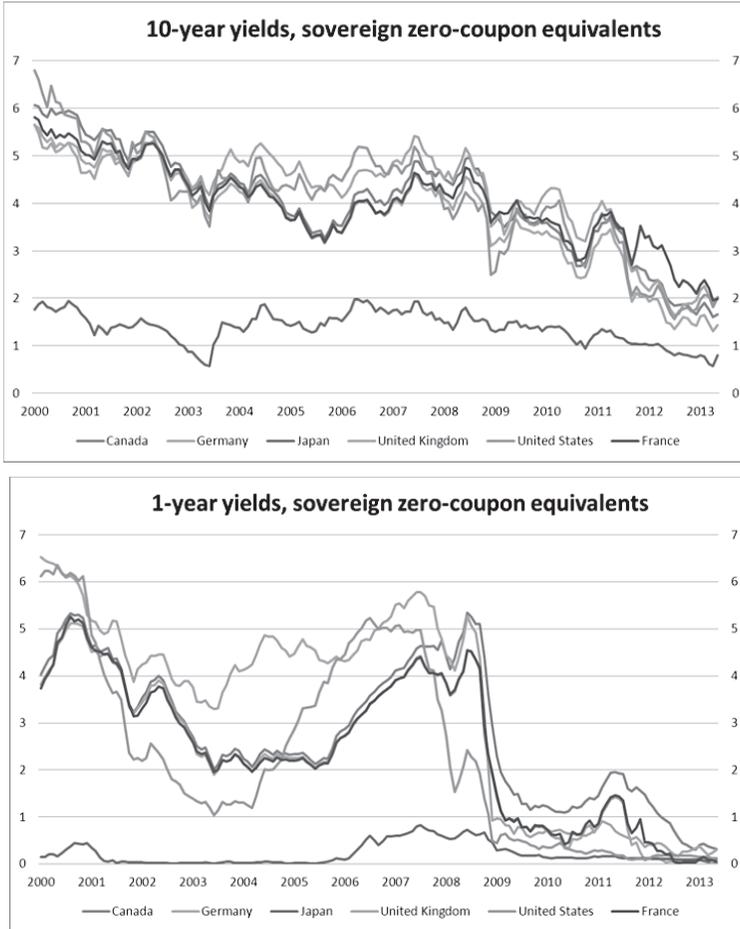# Ten and One-Year Yields, Industrial Production and Inflation in Advanced Economies
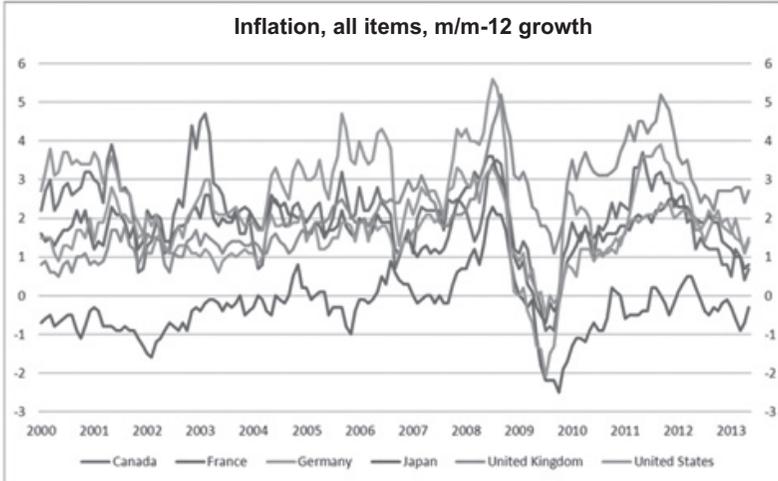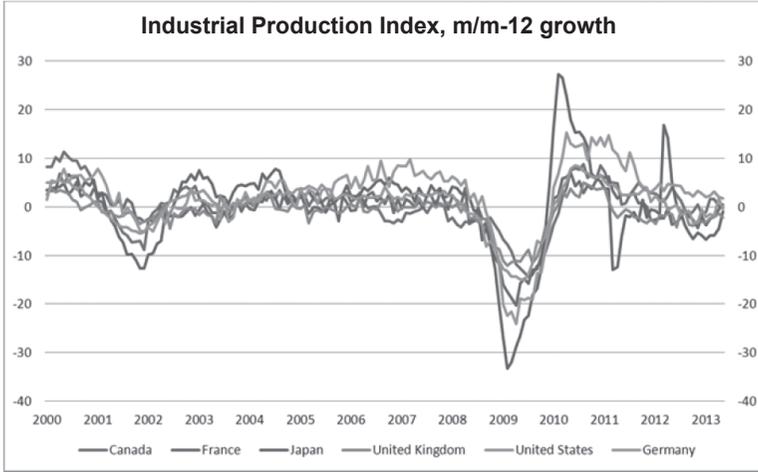
Chart 3 continued

Industrial Production Index, m/m-12 growth

Canada — France — Japan — United Kingdom — United States — Germany

Inflation, all items, m/m-12 growth

Canada — France — Germany — Japan — United Kingdom — United States

Sources: Bloomberg; latest observation: July 2013.

response to a common cycle and inflation outlook, one needs co-movement in the term premium to fully explain the high correlation of bond yields.[3] In fact, Bauer and Diez de los Rios (2012a) find that the term premium is common across national markets and driven by global macroeconomic conditions. This can be seen in two features of their estimated global term premium: first, a long-run structural decline, reflecting the reduction in both the level and volatility of global inflation, and, second, a strongly countercyclical behavior, rising sharply during global recessions and falling during global expansions. As argued by Bauer and Diez de los Rios (2012b) this has implications for monetary policy as typically monetary policy will have to ease more in recessions to offset the rise in the term premium.[4]

With this research in mind, we can look a bit more closely at recent developments in the euro area and U.S. term structure.[5] Chart 4 shows the five-year yield in the euro area and the U.S. and its decomposition into three parts: the average expected real interest rate, the expected path of future inflation and a term premium. This decomposition is based on the estimated macroeconomic affine factor, no-arbitrage term structure model of Hördahl and Tristani (2010). Their methodology includes inflation-linked bond yields and survey expectations of short-term interest rates and inflation to make the estimates of the various components more robust.[6] Nevertheless, it is worth mentioning that there is quite a bit of model uncertainty associated with such decomposition. One factor of uncertainty is that the model does not explicitly take into account the effective lower bound on nominal interest rates, which may bias the estimate of the expected real component up and the estimate of the forward premium down.[7]

Five-year bond yields have fallen to historically low levels since the start of the financial crisis (from close to 5 percent to below 1 percent) in both areas. Which components have contributed the most and explain the correlation of 87 percent? First, in both areas the expected inflation component is quite stable and close to the objective for inflation, suggesting that inflation expectations are very well anchored. This component can therefore explain neither the fall in long rates nor the comovement.

Chart 4
Five-Year Yields and Their Decomposition in the United States and the Euro Area
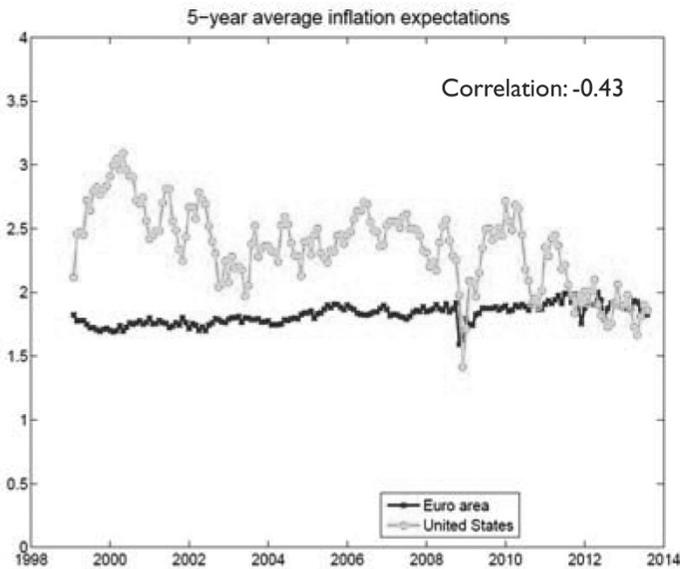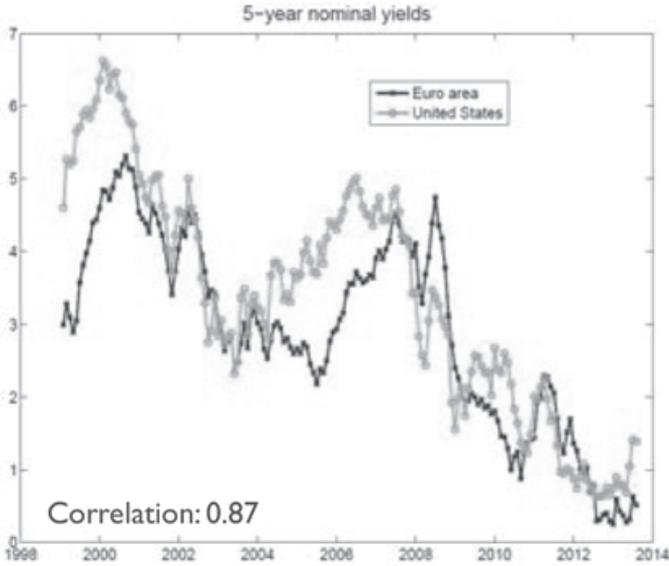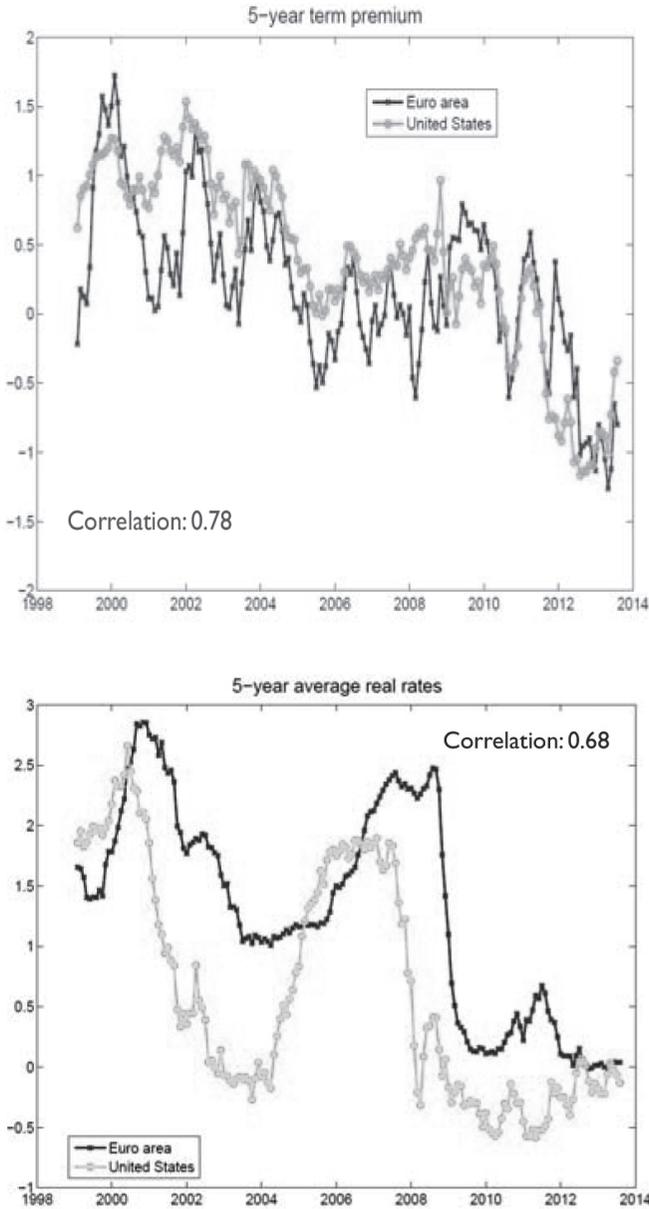

5-year nominal yields

Correlation: 0.87

5-year average inflation expectations

Correlation: -0.43

Chart 4 continued

5-year term premium

5-year average real rates

Sources: Federal Reserve Bank, Bundesbank; latest observation: July 2013.
Note: Decomposition is based on Hördahl and Tristani (2010); Nominal yield = Average expected real rate + average expected inflation + term premium.

Second, the term premium has fallen over time in both areas, in particular since the end of 2009, and it has the highest correlation across both areas of the three components (78 percent), which is consistent with the literature that I briefly reviewed before. Remarkable is that, according to this model, the forward premium has been negative (with a few exceptions) since early 2010 and particularly since the summer of 2011. Given the subdued growth in the euro area and less so in the U.S., the negative premium since 2010 goes counter to the finding reported above that typically the term premium is countercyclical. While a number of factors may explain this, it may be prima facie evidence that the large expansion of central bank balance sheets in the major advanced economies has suppressed the term premium. Indeed, there is quite a bit of evidence that both the Large Scale Asset Purchase (LSAP) programs of the Fed and the Quantitative Easing (QE) programs of the Bank of England, as well as the Long-Term Refinancing Operations (LTROs) of the ECB have reduced long-term bond yields.[8]

Third, the expected real interest rate component has fallen the most (by about 2.5 percentage points) in both areas, which is mostly the result of the easing of standard monetary policy. This component is currently around zero at the five-year horizon in both currency areas. Not surprisingly both components are highly correlated (65 percent), but there is also evidence the U.S. component is typically leading the euro area component. This is consistent with evidence that the euro area business cycle is lagging the U.S. one on average by about two quarters.[9]

In sum, the historically low long-term interest rates are driven by both historically low expected real rates reflecting current and expected policy easing and a historically low term premium, with quite a bit of uncertainty about the relative contribution. They have contributed to easy financial conditions in a difficult economic environment, in particular in the euro area.

The recent rise in the term premium, possibly driven by the expectation that the expansion of global liquidity through central bank balance sheets is going to unwind, therefore raises two important policy questions: 1) to what extent does this lead to an inappropriate

tightening of financial conditions; and 2) will the euro area be able to decouple its long-term interest rate from the international one, if that would turn out to be necessary.

The first question can be rephrased as "Do changes in the long-term interest rate driven by the term premium have an equally large impact on the economy as changes in the yield curve coming from expected short rates?" From a theoretical and empirical perspective it is not clear that this should be the case. Kiley (2012) finds that changes in the long-term interest rate that are driven by short-term rates have a larger (almost double) impact on aggregate demand and inflation than those driven by the term premium. This is consistent with the results in the more theoretical models of Andrés, López-Salido and Nelson (2004) and Chen, Cúrdia and Ferrero (2011), as well as the discussion in Krishnamurthy and Vissing-Jorgensen (2013) in this volume. The intuition for this result is that in models of preferred habitat or financial market segmentation changes in long-term rates driven by current and expected short rates affect all financial prices and therefore all agents, while changes in the premium only directly affect the preferred-habitat agents and neighboring habitats through imperfect arbitrage. The relative economic importance of these channels then depends on the relative importance of such agents. At the same time, the impact will also depend on the state of the financial sector: For example, in the framework of Gertler and Karadi (2013) a shock to government bond prices will also affect the bank's ability to expand credit.

Regarding the second question (Will the euro area be able to decouple, if necessary?), it is not clear that to the extent that a rise in the term premium is driven by global conditions, a single central bank can influence the premium directly by nonstandard policy measures. However, long yields can be steered through standard policy. The 2004-05 episode illustrates that the ECB can keep the real component of long rates relatively low, while the real rate component in the U.S. is rising. In fact, this has been a pattern in both previous tightening cycles. What is different now is that the nominal short-term interest rate is close to its effective lower bound, so that there is less room to ease short-term rates and that the implicit tightening

may happen mostly through expected future rates. In these circumstances, it becomes more important to distinguish the appropriate policy stance by giving guidance on future interest rates.

And that is the context in which recently the ECB has taken the unprecedented step of introducing forward guidance. In both the July and August policy meeting, the Governing Council of the ECB has stated that it "expects the key ECB interest rates to remain at present or lower levels for an extended period of time. This expectation is based on the overall subdued outlook for inflation extending into the medium term, given the broad-based weakness in the real economy and subdued monetary dynamics." As explained by Praet (2013), this is not a promise to be "irresponsible," i.e., to generate higher inflation as Paul Krugman has suggested. Instead the forward guidance is meant to clarify both the assessment of the ECB of the current subdued outlook for inflation (the Delphic part) and the reaction function based on the ECB's two-pillar strategy (the Odyssean part) and thereby ensure that an appropriate stance of monetary policy is maintained.[10] Indeed, the modalities of the ECB's forward guidance are fully consistent with the ECB's mandate and with its monetary policy strategy, as 1) it is based on the Governing Council's aim of accomplishing inflation rates that, over the medium term, are below, but close to 2 percent; 2) the extended period of time over which the Governing Council expects the key ECB interest rates to remain at present or lower levels is a flexible horizon conditional on this assessment, and 3) the underlying conditions are based on the ECB's approach to organizing, evaluating and cross-checking the information according to its two-pillar strategy.[11]

Chart 5 shows that the initial effect of the ECB's communication about forward guidance has been to reverse some of the upward pressure on the short-term term structure following the Fed's communication about tapering and its exit policy. Some of these initial effects have unwound subsequently. The effectiveness of the expectations channel will depend on the clarity and the credibility of the forward guidance. This credibility may be supported by nonstandard actions. In the case of the ECB, the Governing Council has explicitly mentioned that "forward guidance is not linked to the decision taken

Chart 5
The Impact of ECB Forward Guidance on
EONIA Forward Swap Rates
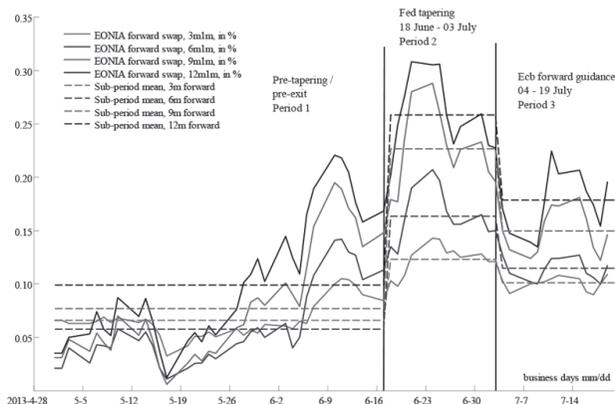
by the Governing Council on 2 May to extend the horizon for the fixed rate tender procedure with full allotment until July 2014." In principle, however, one could use fixed or variable-rate (LTROs) to explicitly underpin the horizon of forward guidance and this is not inconsistent with conditionality. In the recent past, for example, the lengthening of average maturity of the LTROs at the end of 2011 is likely to have contributed to a flattening of the yield curve, although such effects are difficult to distinguish from the impact of excess liquidity creation which pushes down the EONIA to the deposit rate and the signaling of standard monetary policy.

III.   The Sovereign Debt Crisis and Monetary Policy in the Euro Area

Let me now move briefly to the case of sovereign bond market divergence in the euro area, which was triggered by news of fiscal profligacy in Greece in 2009-10. In a number of euro area countries, the rapidly rising government debt in response to the financial crisis of 2008-09, as well as the uncertainty regarding implicit government liabilities from guaranteeing the banking sector, led to a confidence crisis in government finances and rising sovereign spreads.[12]

This divergence of sovereign yields in the euro area has had profound effects on the functioning of the single currency area. It set in motion a mutually reinforcing negative spiral between sovereign

and banking risks in the euro area (Chart 6), which then spilled over into the cost of finance of nonfinancial sectors and contributed to a protracted period of slightly negative growth rates in 2012 and the first quarter of 2013.

Chart 6 also shows that even large, cyclically insensitive firms like telecoms saw their funding costs rise as government yields rose. More importantly, the widening bond spreads translated in heterogeneous developments in the cost of small and large loans of nonfinancial corporations as illustrated in Chart 7. Calculations based on the ECB's interest rate pass-through models suggest that the rising sovereign spreads in Italy and Spain have contributed to an increase of between 75 and 100 basis points in the composite lending rates to NFCs and households.[13] These estimates are confirmed by other research. For example, Neri (2013) estimates the pass-through of sovereign yield spreads on bank lending rates to nonfinancial corporations and households and finds that, if sovereign spreads had remained constant at the levels recorded in April 2010, the average bank rate to nonfinancial corporates in the peripheral countries would have been 130 basis points lower, while the average dispersion of rates on new loans to nonfinancial corporations would have been equal to 1 percentage point, compared with an actual value of 1.39. Similarly, the average rate for households in the peripheral countries would have been 60 basis points lower, while the average dispersion of bank rates on new loans to households between May 2010 and August 2012 would have not changed much (0.60, compared with 0.56). The knock-on effects on euro area economic activity are shown in Chart 8. It shows the estimated impact of a 100-basis-point increase in the two-year sovereign spread on GDP and credit demand using the panel VAR model of Ciccarelli et al. (2013).[14]

What has the ECB done to counteract the impact of rising sovereign spreads and fragile banks on the economy and the outlook for price stability? It has acted on three fronts. First, it has lowered policy rates to very low levels. Evidence shows that the easing of standard monetary policy not only stimulated the economy, but also contributed to a narrowing of sovereign spreads as it affects the distressed countries more positively than the nonstressed ones.[15] This is indeed

Chart 6
Interaction Sovereign, Bank and Telecom Risks

Euro area bank CDS
(basis points; daily data)

Euro area telecom CDS
(basis points; daily data)
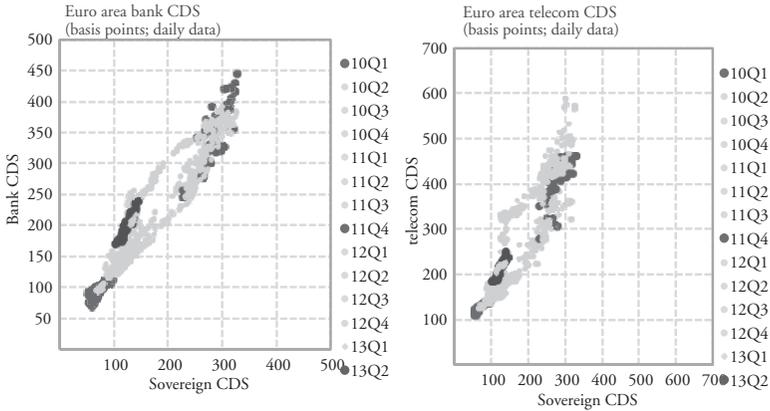
Sources: Thomson Reuters and ECB calculations. Notes 5-year CDS. Bank CDS is calculated as the biggest bank per country, where available, weighted by the ECB capital key. Sovereign CDS is euro area countries CDS weighted by the ECB capital key. Greece is excluded. Telecom CDS is DS European Union Telecom CDS index (apart from euro area telecoms, it includes also Swiss and Scandinavian telecoms). Latest observation: 14-Aug-13.

Chart 7
Short-Term Interest Rates on Small and Large Loans
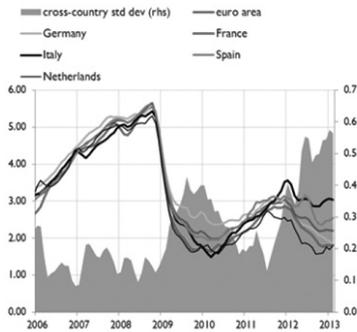# to Nonfinancial Corporations

**Short-term MIR rates on loans to
NFCs of up to 1 EUR million**

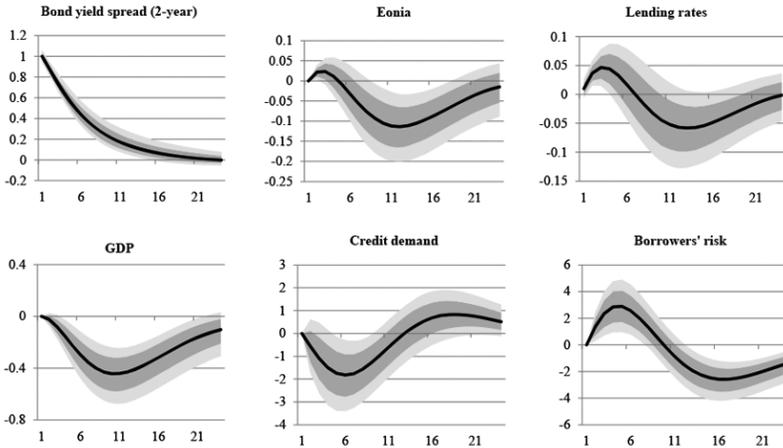*(percentages per annum; three-month moving averages)*
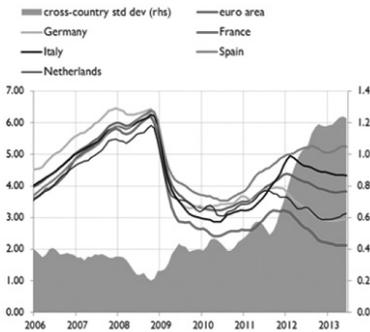
**Short-term MIR rates on loans to
NFCs above 1 EUR million**

(percentages per annum; three-month moving averages)

Source: ECB.
Note: Latest observation: June 2013.

Chart 8
Average Impact of Tightening Sovereign Spreads
## on Euro Area Economy

Sources: Calculations based on Ciccarelli, Maddaloni and Peydro-Alcalde (2013).

what one would expect in a model where distress translates in tighter credit constraints.

Second, the ECB eased again its liquidity support to the banking system to avoid that bank funding problems mutated into excessive deleveraging, solvency problems and a collapse of the financial system. In particular, toward the end of 2011, the ECB offered three-year variable-rate LTROs, which led to almost a doubling of the size of its monetary policy operations. At the same time, it decreased the required reserve ratio and broadened the collateral base, introducing additional credit claims. This liquidity support helped bring down the level of systemic stress; it alleviated the funding problems of banks and thereby stimulated lending. It also led to a reduction of the sovereign spreads and by creating excess liquidity pushed the overnight money market rate close to its lower threshold given by the central bank deposit rate which currently stands at zero. All these effects are illustrated in Chart 9, which shows the impact of an increase in the liquidity support on the economy and prices through these various channels, using a VAR analysis of Boeckx et al. (forthcoming).[16]

Chart 9
Effects of Liquidity Support in the Euro Area
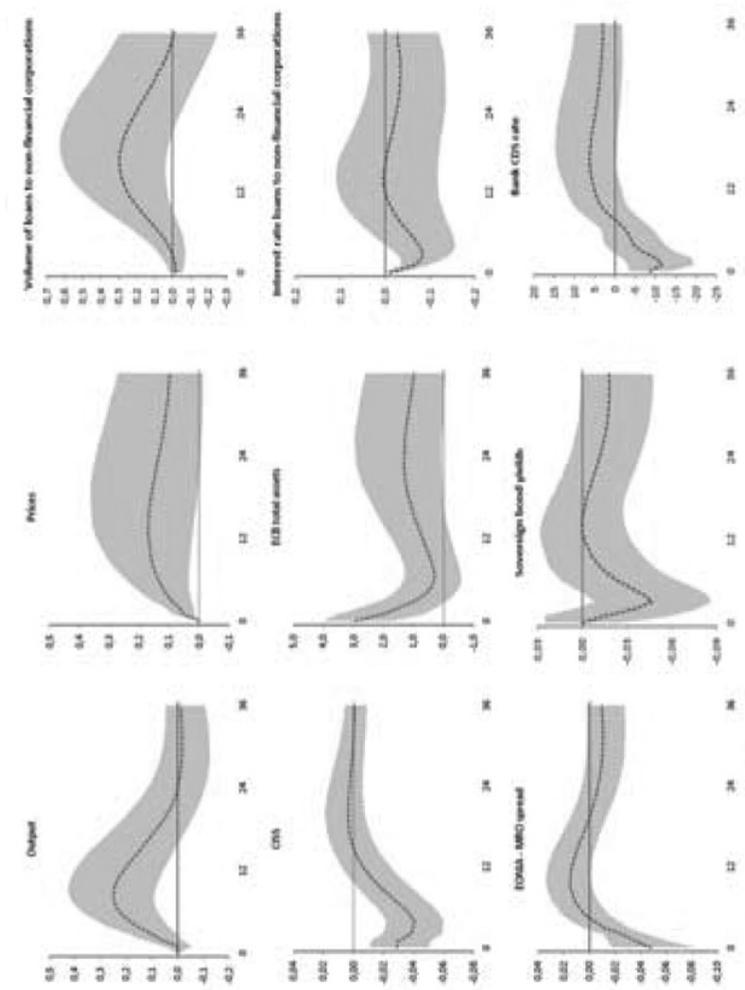
Note: Figures show median responses, together with 16th and 84th percentiles of the posterior distribution; horizion is monthly.
Sources: Dossche et al., forthcoming.

Finally, in order to address distortions in sovereign bond markets directly, the ECB also extended its nonstandard measures to directly intervene in government bond markets, first through the Securities Markets Programme and more recently through the Outright Monetary Transactions program. The latter was specifically designed to counter distortions in government bond markets arising from fears of a break up of EMU and the associated redenomination risk and thereby preserve the singleness of monetary policy. Without so far spending a cent, it has managed to bring down sovereign spreads to levels that more reasonably capture credit risk. A crucial design feature and success factor of this programme is the strict and effective conditionality attached to an appropriate EFSF/ESM program. This conditionality is crucial to manage the credit risk on the ECB's balance sheet, to preserve incentives for governments to conduct prudent fiscal policy, to ensure collective peer pressure by euro area governments, to leave market discipline intact, all with the view of ensuring monetary dominance.

IV.   Concluding Remarks

So, let me conclude. Government bond markets are not only a window on the future; they also help shape the future. I tried to indicate how both the high comovement of government bond yields in the advanced economies and the divergence of bond yields within the euro area have been posing challenges for ECB monetary policy and how the ECB has responded to those challenges with various standard and nonstandard policy measures. There are many signs that the euro area economy is healing and that its rebalancing is proceeding. The accommodative stance of monetary policy facilitates this adjustment process and it is important that bond markets continue to help transmitting this policy stance.

Endnotes

[1]See, for example, Kaminska et al. (2011) who show that the correlation between the five-year forward five-years-ahead in the United States and Germany has increased from zero or negative in the 1970s to highly positive at around 80 percent since the late 1980s.

[2]See, for example, Arghyrou and Kontonikas (2011); Borgy et al. (2011); Ejsing et al. (2011); and De Grauwe and Ji (2011). Most of these papers document a regime change in the determinants of sovereign bond spreads before and after the financial crisis. De Santis (2012) provides evidence of contagion in euro area government bond markets.

[3]See, for example, Diebold, Li and Yue (2008); Kaminska et al. (2011); Jotikasthira et al. (2010); and Bauer and Diez de los Rios (2012a).

[4]The countercyclicality of the term premium has also been found in Cochrane and Piazzesi (2005) and Joslin, Priebsch and Singleton (2010).

[5]See Bernanke (2013) for a recent analysis of the U.S. term structure.

[6]More specifically, building on Ang and Piazzesi (2003), Hördahl and Tristani (2010) adopt the framework developed in Hördahl, Tristani and Vestin (2008), in which bonds are priced based on the dynamics of the short rate obtained from the solution of a linear forward-looking macro model and using an essentially affine stochastic discount factor.

[7]For a recent analysis on how the lower bound affects term structure models and estimates of forward premiums, see Kim and Singleton (2011) and Bauer and Rudebusch (2013).

[8]See, for example, Santor and Suchanek (2013) for a recent summary of the available empirical evidence.

[9]See, for example, Giannone and Reichlin (2004).

[10]For a discussion of the Delphic and Odyssean interpretation of forward guidance, see Campbell et al. (2012).

[11]See ECB (2013a).

[12]See De Santis (2012) and Neri and Ropele (2013) for an analysis of spillovers from credit events in Greece on other countries.

[13]See ECB (2013b).

[14]Neri and Ropele (2013) investigate the impact of the sovereign debt crisis on the euro area economy and the distressed versus nondistressed countries using a FAVAR approach. One striking finding is that the impact on economic activity is quite similar across both groups, whereas the impact on loans and loan rates is very different.

[15]See Ciccarelli et al. (2013).

[16]See also De Santis and Darracq-Paries (2013).

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